



Nursing Home Compare Claims- Based Quality Measure Technical Specifications

Final

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Revision History

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This update to the Specifications contains new coefficients for the claims-based quality measure models. The claims-based quality measures are risk-adjusted using logistic regression. Covariates include items from claims that preceded the start of the stay and information from the first Minimum Data Set 3.0 (MDS) assessment. The logistic regression coefficients, including the weights used to calculate the outcome-specific comorbidity index are updated each time the measure is updated on Nursing Home Compare. The MDS items that are included in the final models will also change with each update. In developing each measure, Abt Associates' internal clinical/MDS expert identified a list of MDS items most likely to increase or decrease the likelihood of the outcome. These MDS items are included in the final models if they are statistically significant predictors of the outcome based on current data. The list of claims-based items included in the final models is not subject to change.

The list of MDS items included in the current risk-adjustment models are described in Tables 3, 7, and 10 in this document. All model coefficients estimated for the current period are reported in the Appendix (a separate document).

Revision 2: July 25, 2018

This update contains the specifications for the Number of Hospitalizations per 1,000 Long-Stay Resident Days measure, including details on the numerator and denominator for the measure, exclusions, and the measure calculation methodology. The technical specifications will be updated with details on the risk-adjustment model prior to this measure being posted on Nursing Home Compare in October 2018.

This update adds MDS variables to the risk-adjustment models of the short-stay, claims-based quality measure and updates the coefficients for each variable, based on data from October 1, 2016 to September 30, 2017.

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PERCENTAGE OF SHORT-STAY RESIDENTS WHO WERE RE-HOSPITALIZED AFTER A NURSING HOME ADMISSION

Measure Name

The measure name is Percentage of Short-Stay Residents Who Were Re-Hospitalized after a Nursing Home Admission.

Purpose of Measure

If a nursing home sends many residents back to the hospital, it may indicate that the nursing home is not properly assessing or taking care of its residents who are admitted to the nursing home from a hospital.

This claims-based quality measure was first reported by CMS in April 2016, and integrated into the Five-Star Quality Rating System in July 2016. It reports the percentage of short-stay residents who were re-hospitalized after a nursing home admission. This section describes the specifications and risk-adjustment methodology for this measure.

Measure Description and Specifications

The short-stay re-hospitalization measure determines the percentage of all new admissions or readmissions to a nursing home from a hospital where the resident was re-admitted to a hospital for an inpatient or observations stay within 30 days of entry or reentry. Planned inpatient readmissions are excluded. Note that higher values of the short-stay re-hospitalization measure indicate worse performance on the measure.

See Table 1 for detailed specifications for the measure.

Numerator: The numerator for the measure is the number of nursing home stays¹ where the resident had one or more unplanned inpatient admissions or one or more outpatient claims for an observation stay within 30 days of entry/reentry. This includes inpatient or observation stays occurring after discharge from the nursing home but within the 30 day timeframe.

Planned inpatient readmissions are not counted in the numerator since they are not a signal of quality of care. A modified version of CMS's Planned Readmissions Algorithm is used to classify hospitalizations as planned or unplanned.² The algorithm developed to identify planned hospital admissions uses the principal discharge diagnosis category and all procedure codes for each readmission coded using the AHRQ CCS software. Unless the hospital readmission met the algorithm definition of planned, it is considered unplanned and counted as a hospital admission in the measure. If any of the procedures denoted as planned occurs in conjunction with a diagnosis that disqualifies a readmission from being

¹ Note that a stay is defined as a set of contiguous days in a facility. A stay begins when a resident enters a nursing facility (i.e., based on the entry/reentry date from the MDS) and ends when the person leaves the nursing home (based on discharge date from the MDS, regardless of whether the discharge was planned or the resident was anticipated to return to the facility).

² We applied the same modified version of CMS's Planned Readmissions Algorithm use by RTI to calculate the SNFRM: Smith L, et al. Skilled Nursing Facility Readmission Measure (SNFRM) NQF #2510: All-Cause Risk-Standardized Readmission Measure. RTI International: Draft Technical Report. March, 2015. Accessed at: <https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/NursingHomeQualityInits/Downloads/SNFRM-Technical-Report-3252015.pdf>

considered planned, it is considered an unplanned hospital admission. The planned readmissions algorithm is based on two main principles:

1. Planned readmissions are those in which one of a pre-specified list of procedures took place or readmissions for one of the following took place: bone marrow, kidney, or other transplants. Planned diagnosis categories include maintenance chemotherapy and rehabilitation. Pregnancy diagnoses and procedures such as normal pregnancy, Cesarean section; forceps delivery, vacuum, and breech delivery are also considered planned. Readmissions to psychiatric hospitals or units are also classified as planned readmissions.
2. Admissions for acute illness or for complications of care are not classified as “planned.” Even a typically planned procedure performed during an admission for an acute illness would not likely have been planned.

Note that observation stays are included in the measure regardless of their diagnosis.

Denominator: The measure includes Medicare fee-for-service enrollees³ who entered or reentered the nursing home from a hospital, were not enrolled in hospice during their nursing home stay, and who were not identified as comatose based on the MDS admission assessment.

- Medicare fee-for-service enrollees are identified using the CMS Enrollment Database. Any stay that is for a beneficiary who was enrolled in a Medicare Advantage plan for any part of the stay or who was not enrolled in both Medicare Part A and B for any part of their stay is excluded.
- Stays that were preceded by an inpatient hospitalization are identified using stay dates linked to Medicare Part A claims. If the hospital discharge date is within one day of the stay start date, then the stay is defined as having been preceded by an inpatient hospitalization and is eligible to be included in the measure.
- We look at the ‘from’ and ‘thru’ dates on hospice claims. If these overlap the nursing home stay, then the stay is excluded.

The denominator for the measure is the number of eligible nursing home stays, after applying the exclusions described above.

³ Because the measure uses Medicare claims data, it can only be calculated for Medicare fee-for-service beneficiaries.

Table 1. Percentage of Short-Stay Residents who were Re-hospitalized after a Nursing Home Admission

Measure Description	The percent of short-stay residents who entered or reentered the nursing home from a hospital and were re-admitted to a hospital for an unplanned inpatient stay or observation stay within 30 days of the start of the nursing home stay.
Numerator and Denominator Window	The numerator and denominator include stays that started over a 12-month period. The data have a lag time of nine months.
Numerator	The numerator includes nursing home stays for beneficiaries who: <ul style="list-style-type: none"> a) Met the inclusion and exclusion criteria for the denominator; AND b) Were admitted to a hospital for an inpatient stay or outpatient observation stay within 30 days of entry/reentry to the nursing home, regardless of whether they were discharged from the nursing home prior to the hospital readmission. Note that inpatient hospitalizations and observation stays are identified using Medicare claims; AND c) The hospital readmission did not meet the definition of a planned hospital readmission (identified using principal discharge diagnosis and procedure codes on Medicare claims for the inpatient stay)
Denominator	Included in the measure are stays for residents who: <ul style="list-style-type: none"> a) Entered or reentered the nursing home within 1 day of discharge from an inpatient hospitalization (Note that inpatient rehabilitation facility and long-term care hospitalizations are not included). These hospitalizations are identified using Medicare Part A claims; AND b) Entered or reentered the nursing home within the target 12-month period
Denominator Exclusions	Short-stay residents are excluded if: <ul style="list-style-type: none"> a) The resident did not have Fee-for-Service Parts A and B Medicare enrollment for the entire risk period (measured as the month of the index hospitalization and the month after the month of discharge from the nursing home); OR b) The resident was ever enrolled in hospice care during their stay; OR c) The resident was comatose (B0100 = [01]) or missing data on comatose on the first MDS assessment after the start of the stay; OR d) Data were missing for any of the claims or MDS items used to construct the numerator or denominator; OR e) The resident did not have an initial MDS assessment to use in constructing covariates for risk-adjustment.
Covariates	See Tables 2 and 3 for the list of claims-based and MDS-based covariates included in the logistic regression for calculating the facilities' expected rates and the Appendix tables for the risk-adjustment model covariates.

Risk Adjustment

The goal of risk adjustment is to account for differences across nursing homes in patient demographic and clinical characteristics that might be related to the outcome but not to the quality of care provided by the nursing home. Thus, the covariates consist of conditions/diagnoses that were present at the start of the nursing stay. Covariates include both items from claims that preceded the start of the stay and information from the first Minimum Data Set 3.0 (MDS) assessment with a target date within 14 days of the beginning of the stay.

Claims-based covariates: Table 2 details the rationale for each of the final selected set of covariates constructed using Medicare claims and enrollment data and used in the risk-adjustment model of the short-stay re-hospitalization measure.

Table 2. Covariates constructed from claims and used in the risk-adjustment model for Short-Stay Residents who were Re-hospitalized after a Nursing Home Admission

Variable	Rationale
Age	Demographic characteristic that is often important for outcomes of nursing home residents and associated with higher frailty and increasing number of comorbidities.
Sex	Demographic characteristic that is important for predicting hospital readmission for the nursing home population.
Length of stay during the hospitalization preceding the nursing home stay	Patients who are hospitalized for longer periods of time may require more complex care because they are often sicker. In addition, bed rest from prolonged hospitalizations often leads to deconditioning and functional impairment.
Any time spent in the intensive care unit (ICU) during the hospitalization preceding the nursing stay	ICU stays are an important indicator of medical severity and a predictor of PAC resource use.
Ever enrolled in Medicare under Disability coverage	This is an indicator of overall patient complexity, as qualification for Medicare because of disability requires the presence of serious chronic medical conditions that limit the ability to work.
ESRD	This factor has been identified as a risk factor in prior studies of outcomes among nursing home residents.
Number of acute care hospitalizations in the 365 days before the beginning of the nursing stay	More hospitalizations in the previous year may be associated with declining health and increased complexity of care
Principal diagnosis as categorized using AHRQ's single-level CCS	First diagnosis from the Medicare claim corresponding to the prior proximal hospitalization as coded by AHRQ's CCS
Outcome-specific Comorbidity Index	Patients with multiple or more severe comorbidities will tend to be frailer, putting them at increased risk for being readmitted to a hospital. This Index is based on the clinical conditions included in the Charlson Comorbidity Index and captures the complexity beyond the linear additivity of the individual comorbidities. See the sub-section below for more details.

MDS-based covariates: For each measure, Abt Associates' internal clinical/MDS expert identified a list of MDS items most likely to increase or decrease the likelihood of the outcome and unrelated to the quality of care received while a resident. These items span multiple domains: functional status, clinical conditions, clinical treatments, and clinical diagnoses. Items included in the risk adjustment model are listed in Table 3.

Table 3. Covariates constructed from the MDS items and used in the final risk-adjustment model for Short-Stay Residents who were Re-hospitalized after a Nursing Home Admission

Category	MDS Item
Functional status	<p> Rarely makes self-understood by others (B0700) Rarely able to understand others (B0800) Cognitive status not completely intact (C0100 – C1000) Cognitive assessment missing (C0100 and C0600) Acute change in mental status (C1600) Rejected care for past four to seven days (E0800) Wandering once or more in the past week (E0900) Walks in room independently or with supervision or limited assistance (G0110C1) Walks in corridor independently or with supervision or limited assistance (G0110D1) Wanders <i>and</i> walks in room or corridor independently or with supervision or limited assistance (E0900, G0110C1 and G0110D1) Alzheimer's or non-Alzheimer's dementia and walks in room or corridor independently or with supervision or limited assistance (I4200, I4800, G0110C1 and G0110D1) Two-person support needed with one or more ADLs (G0110A2 – G0110J2) Dependence in eating (G0110H1) Fell in the last month (J1700A) Fell in the past two to six months (J1700B) Coughing or choking during meals or when swallowing medications (K0100C) </p>
Clinical conditions	<p> Total bowel incontinence (H0400) Daily pain (J0400) Shortness of breath with exertion (J1100A) Shortness of breath when sitting at rest (J1100B) Shortness of breath when lying flat (J1100C) End-stage prognosis (J1400) Dehydrated (J1550C) Internal bleeding (J1550D) Venous/Arterial ulcer present (M1030) Foot infection (M1040A) Diabetic foot ulcer (M1040B) Surgical wound (M1040E) Burn(s) (M1040F) </p>
Clinical treatments	<p> Ostomy care (H0100C) Parenteral/IV feeding (K0510A2) Feeding tube (K0510B2) Insulin (N0350A) Anticoagulant received (N0410E) Antibiotic received (N0410F) Chemotherapy for cancer (O0100A1 or O0100A2) Radiation for cancer (O0100B1 or O0100B2) Oxygen therapy (O0100C1 or O0100C2) Suctioning (O0100D2) Tracheostomy care (O0100E1 or O0100E2) Ventilator or respirator (O0100F2) IV medications (O0100H1 or O0100H2) Transfusions (O0100I2) Dialysis (O0100J1 or O0100J2) Isolation or quarantine for active infectious disease (O0100M2) Speech-Language Pathology and Audiology Services (O0400A4) Respiratory Therapy (O0400D2) </p>

Category	MDS Item
Clinical diagnoses	Cancer (I0100) Anemia (I0200) Heart failure (I0600) Orthostatic hypotension (I0800) Ulcerative Colitis/Crohn's disease/inflammatory bowel disease (I1300) Multidrug-resistant organism (I1700) Pneumonia (I2000) Septicemia (I2100) Tuberculosis (I2200) Urinary tract infection (I2300) Viral hepatitis (I2400) Wound infection (I2500) Diabetes mellitus (I2900) Alzheimer's disease (I4200) Non-Alzheimer's dementia (I4800) Seizure disorder or epilepsy (I5400) Asthma, COPD, chronic lung disease (I6200) Respiratory Failure (I6300)
Other	Returned to the nursing home following hospitalization (A1700 and A1800) First assessment was for significant change in status (A0310A)

Comorbidity index: The risk-adjustment model includes an outcome-specific comorbidity index to partially adjust facility-level rates for the case-mix of residents at the facility with respect to comorbidity status at the start of the residents' stay. The comorbidity index is based on the 17 ICD-9-CM based disease condition categories initially developed by Charlson/Deyo.⁴ Using the ICD-9-CM coding algorithm developed by Quan et al.,² we identified the Charlson comorbidities in any of the 21 diagnosis coding fields on all acute hospitalizations claims in the 365 days preceding the patient's nursing home stay. Weights were calculated for each diagnosis indicator through logistic regression of the short-stay re-hospitalization measure, using all available nursing home stays after a hospital discharge for the time period covered by the measure. The comorbidity index includes only the subset of the 17 ICD-9 based disease conditions for which the logistic regression coefficient was significant at a probability level of 0.05 or better. The appropriate coefficients were used to create a comorbidity index value for each nursing home stay, and these values were used in the logistic regression risk-adjustment model.

Measure Calculations

Observed rate: The actual (observed) rate for a nursing home is calculated as the number of stays where the resident met the numerator criteria divided by the total number of stays that met the denominator criteria in the year.

Expected rate: The risk adjustment model is estimated using logistic regression. The results from the logistic regression are used to calculate the probability of the outcome for each nursing home stay. This

⁴ Quan H, Sundararajan V, Halfon P, et al. Coding algorithms for defining comorbidities in ICD-9-CM and ICD-10 administrative data. Medical Care 2005;43(11):1130-1139. The 17 conditions categories include: Myocardial infarction, chronic heart failure, peripheral vascular disease, cerebrovascular disease, dementia, chronic obstructive pulmonary disease, rheumatoid arthritis, ulcers, mild liver disease, diabetes mellitus, diabetes with sequelae, paralysis, chronic renal disease, cancer, moderate to severe liver disease, metastatic cancer, and HIV/AIDS.

probability can be interpreted as the patient's risk of that outcome given their profile. The expected rate for each nursing home is the average probability across all nursing home stays used to calculate the measure at that nursing home in the past year. The coefficients estimated for the most recent period are reported in Appendix Table A.

Risk-standardized rate: To obtain the risk-standardized rate for any nursing home, the observed rate is divided by the expected rate which is then multiplied by the nationally observed rate—i.e., the sum of all nursing home stays where the resident met the numerator criteria divided by the sum of all nursing home stays that met the denominator criteria in the year.

$$\frac{\text{Observed Rate}}{\text{Expected Rate}} \times \text{National Rate} = \text{Risk Standardized Rate}$$

NUMBER OF HOSPITALIZATIONS PER 1,000 LONG-STAY RESIDENT DAYS

Measure Name

The measure name is Number of Hospitalizations per 1,000 Long-Stay Resident Days.

Purpose of Measure

If a nursing home sends many residents back to the hospital, it may indicate that the nursing home is not properly assessing or taking care of its residents who are admitted to the nursing home from a hospital.

This claims-based quality measure will be reported on Nursing Home Compare starting in October 2018. It reports the ratio of unplanned hospitalizations per 1,000 long-stay resident days. This document describes the specifications for this measure.

Measure Description and Specifications

The long-stay hospitalizations measure determines the number of unplanned inpatient admissions or outpatient observation stays that occurred among permanent (i.e. long-stay) residents of a nursing home during a one-year period, expressed as the number of unplanned hospitalizations for every 1,000 days that the long-stay residents were admitted to the facility (i.e. “long-stay resident days”). Higher values of the long-stay hospitalizations measure indicate worse performance on the measure. See Table 4 for detailed specifications for the measure.

Numerator: The numerator for the measure is the number of admissions to an acute care or critical access hospital, for an inpatient or outpatient observation stay, occurring while the individual is a long-term nursing home resident.

Planned inpatient admissions are not counted in the numerator since they are unrelated to the quality of care at the nursing home. Hospitalizations are classified as planned or unplanned using the same version of CMS’s Planned Readmissions Algorithm used to calculate the Short-Stay hospital readmissions measure used in the Nursing Home Compare Five-Star Rating system.⁵ The algorithm identifies planned admission using the principal discharge diagnosis category and all procedure codes listed on inpatient claims, coded using the AHRQ CCS software. Observation stays are included in the measure regardless of diagnosis. The numerator also excludes unplanned inpatient admissions and observation stays that occur while a resident is enrolled in hospice.⁶

⁵ The Planned Readmissions algorithm is also used by RTI to calculate the SNFRM. It is described in more detail in the current version of the Claims-based Measures Technical Specifications document, or in the following link: <https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/NursingHomeQualityInits/Downloads/SNFRM-Technical-Report-3252015.pdf>

⁶ Hospice days are identified by Medicare FFS Hospice claims.

Denominator: The measure includes Medicare FFS enrollees⁷ with a single stay or sequence of stays during which the individual resides in the nursing home for a total of 101 days or more without a gap of 30 contiguous days living in the community or other institution. The denominator is the total number of days (in thousands) during the target period that all long-stay residents were in the nursing home facility after they attained long-term resident status (i.e., after 100 cumulative days at the facility).⁸ The denominator does not include the days between nursing home stays, including days that a resident is admitted to an inpatient facility or other institution, or days the resident was enrolled in hospice. If the resident is discharged due to death, the day the resident died is also excluded from the denominator.

Table 4: Number of Hospitalizations per 1,000 Long-Stay Resident Days

Measure Description	Number of unplanned inpatient admissions or all-cause outpatient observation stays at an acute care or critical access hospital occurring in the target period and while the individual is a long-term nursing home resident.
Numerator and Denominator Window	All days after the resident's one-hundredth cumulative day in the nursing home or the beginning of the 12-month target period (whichever comes earlier) and until the day of discharge, the day before the resident dies, or end of the 12-month target period (whichever comes first). The data have a lag time of nine months (e.g., data posted in June includes data from January to December in the prior calendar year).
Numerator	The numerator includes all inpatient hospital admissions or outpatient observation stays for Medicare beneficiaries who: <ul style="list-style-type: none"> a) Met the inclusion and exclusion criteria for the denominator; AND b) Were admitted to an acute care or critical access hospital for an inpatient stay or outpatient observation stay while they were residing in the nursing home and not enrolled in hospice; AND c) Were not admitted on the date of their death; AND d) Were not admitted for a planned hospital inpatient admission (defined by the principal discharge diagnosis and procedure codes on Medicare claims for the inpatient stay).
Denominator	The sum of all long-stay days in the target period, divided by 1,000. A long-stay day is any day after a resident's one-hundredth cumulative day in the nursing home or the beginning of the 12-month target period (whichever comes first) and until the day of discharge, the day before the resident dies, or the end of the 12-month target period (whichever comes first).

⁷ Because the measure uses Medicare claims data, it can only be calculated for Medicare fee-for-service beneficiaries.

⁸ In other words, for each resident, the total number of long-stay days is the cumulative days beginning with the time the resident became a long-stay resident (or the start of the observation period if long-stay status was already attained) and ending with either a discharge or the end of the reporting period (whichever comes first). The denominator is the sum of all long-stay days in the target period, divided by 1,000.

Denominator Exclusions	<p>Long-stay residents meeting any of the following criteria are excluded:</p> <ul style="list-style-type: none"> a) The resident was not a Medicare beneficiary or the resident was enrolled in Medicare managed care during any portion of the stay, i.e. between admission and discharge or the end of the target period (whichever comes first); <p>Long-stay days meeting any of the following criteria are excluded:</p> <ul style="list-style-type: none"> a) The resident was enrolled in hospice care; b) The resident died; c) The resident was not in the nursing home for any reason during the episode, including days admitted to an inpatient facility or other institution, or days temporarily residing in the community.
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Example of Measure Calculation

For an example of how the measure is calculated, consider the following scenario. Nursing Home Z had a total of 75 long-stay residents, who had a total of 27,375 eligible days as long-stay residents during the measure reporting period. There were a total of 28 unplanned hospitalizations and 7 observation stays among these residents during the period. The denominator is equal to 27,375 long-stay resident days divided by 1000, or 27.375. The numerator is equal to 35 (28 unplanned hospitalizations and 7 observation stays). Nursing Home Z's long-stay hospitalizations rate for 2018 is 1.28 hospitalizations per 1,000 long-stay resident days ($= 35 / 27.375$). For a facility with an average daily census of 75 long-stay residents, this equates to approximately 3 residents being sent to the hospital in a given month ($= 75 \text{ residents} * 30 \text{ days} * 1.28 \text{ hospitalizations} / 1000 \text{ days}$).

Measure Calculations

Observed rate: The actual (observed) rate for a nursing home facility is calculated as the total number of inpatient hospital admissions or outpatient observation stays meeting the numerator criteria divided by the total number of all long-stay days that met the denominator criteria (in hundreds) in the target period. Note that the measure will be reported only for nursing homes that have at least 20 long-stay residents during the reporting period.

Risk Adjustment

While the value reported in the Provider Previews is the observed rate, the measure posted on Nursing Home Compare will be risk-adjusted. The technical specifications will be updated with details on the risk-adjustment model prior to this measure being posted on Nursing Home Compare in October 2018.

SHORT-STAY RESIDENTS WHO HAVE HAD AN OUTPATIENT EMERGENCY DEPARTMENT VISIT

Measure Name

The measure name is Percentage of Short-Stay Residents Who Have had an Outpatient Emergency Department Visit.

Purpose of Measure

If a nursing home often sends many of its residents to the emergency department (ED), it may indicate that the nursing home is not properly assessing or taking care of its residents who are admitted to the nursing home from a hospital. Better preventative care and access to physicians and nurse practitioners in an emergency may reduce rates of ED visits.

This claims-based quality measure was first reported by CMS in April 2016, and integrated into the Five-Star Quality Rating System in July 2016. It reports the percentage of short-stay residents who had an outpatient ED visit after a nursing home admission. This section describes the specifications and risk-adjustment methodology for this measure.

Measure Description and Specifications

The short-stay outpatient ED visit measure determines the percentage of all new admissions or readmissions to a nursing home from a hospital where the resident had an outpatient ED visit (i.e., an ED visit not resulting in an inpatient hospital admission) within 30 days of entry or reentry. Note that higher values of the short-stay outpatient ED visit measure indicate worse performance on the measure.

See Table 4 for detailed specifications for the measure.

Numerator: The numerator for the measure is the number of nursing home stays⁹ where the resident had one or more outpatient claims for an ED visit within 30 days of entry/reentry. This includes outpatient ED visits occurring after discharge from the nursing home but within the 30 day timeframe. Note that outpatient ED visits are included in the measure regardless of their diagnosis.

Outpatient ED visits are not counted in the numerator if the ‘thru’ date on the outpatient claim for the ED visit was equal to the ‘from’ date on an outpatient claim for an observation stay or an inpatient claim for an unplanned hospitalization.¹⁰ In other words, ED visits that were billed as an outpatient event but resulted in admission to a hospital for an observation stay or an unplanned inpatient stay would not be “double-counted” across the short-stay outpatient ED visit measure and the short-stay re-hospitalization measure, which also being added to Nursing Home Compare.

⁹ Note that a stay is defined as a set of contiguous days in a facility. A stay begins when a resident enters a nursing facility (i.e., based on the entry/reentry date from the MDS) and ends when the person leaves the nursing home (based on discharge date from the MDS, regardless of whether the discharge was planned or the resident was anticipated to return to the facility).

¹⁰ See the specifications for the short-stay residents who were re-hospitalized after a nursing home admission measure for the description of planned versus unplanned hospital admissions.

Denominator: The measure includes Medicare fee-for-service enrollees¹¹ who entered or reentered the nursing home from a hospital, were not enrolled in hospice during their nursing home stay, and who were not identified as comatose based on the MDS admission assessment.

- Medicare fee-for-service enrollees are identified using the CMS Enrollment Database. Any stay that is for a beneficiary who was enrolled in a Medicare Advantage plan for any part of the stay or who was not enrolled in both Medicare Part A and B for any part of their stay is excluded.
- Stays that were preceded by an inpatient hospitalization are identified using stay dates linked to Medicare Part A claims. If the hospital discharge date is within one day of the stay start date, then the stay is defined as having been preceded by an inpatient hospitalization and is eligible to be included in the measure.
- We look at the ‘from’ and ‘thru’ dates on hospice claims. If these overlap the nursing home stay, then the stay is excluded.

The denominator for the measure is the number of eligible nursing home stays, after applying the exclusions described above.

Table 5. Percentage of Short-Stay Residents who have had an Outpatient Emergency Department Visit

Measure Description	The percent of short-stay residents who entered or reentered the facility from a hospital, visited an emergency department within 30 days of the start of the stay, and this visit did not result in an inpatient or observation stay.
Numerator and Denominator Window	The numerator and denominator include stays that started over a 12-month period. The data have a lag time of nine months (i.e., the data include stays that started 9–21 months ago).
Numerator	The numerator includes nursing home stays for beneficiaries who: <ul style="list-style-type: none">a) met the inclusion and exclusion criteria for the denominator; ANDb) was admitted to an emergency department within 30 days of entry/reentry to the nursing home, regardless of whether they were discharged from the nursing home prior to the emergency department visit. These emergency department visits are identified using Medicare Part B claims; ANDc) were not admitted to a hospital for an inpatient stay or observation stay immediately after the visit to the emergency department inpatient and observation stays are determined using Medicare Parts A and B claims.
Denominator	Included in the measure are stays for residents who: <ul style="list-style-type: none">a) entered or reentered the nursing home within 1 day of discharge from an inpatient hospitalization (Note that inpatient rehabilitation facility and long-term care hospitalizations are not included). These hospitalizations are identified using Medicare Part A claims; ANDb) entered or reentered the nursing home within the target 12-month period

¹¹ Because the measure uses Medicare claims data, it can only be calculated for Medicare fee-for-service beneficiaries.

Denominator Exclusions	<p>Short-stay residents are excluded if:</p> <ul style="list-style-type: none"> a) the resident did not have Fee-for-Service Parts A and B Medicare enrollment for the entire risk period (measured as the month of the index hospitalization and the month after the month of discharge from the nursing home); OR b) the resident was ever enrolled in hospice care during their nursing home stay; OR c) the resident was comatose (B0100 = [01]) or missing data on comatose on the first MDS assessment after the start of the stay; OR d) data were missing for any of the claims or MDS items used to construct the numerator or denominator; OR e) the resident did not have an initial MDS assessment to use in constructing covariates for risk-adjustment.
Covariates	See Tables 5 and 6 for the list of claims-based and MDS-based covariates included in the logistic regression for calculating the facilities' expected rates and the Appendix tables for the risk-adjustment model covariates.

Risk Adjustment

The goal of risk adjustment is to account for differences across nursing homes in patient demographic and clinical characteristics that might be related to the outcome but not to the quality of care provided by the nursing home. Thus, the covariates consist of conditions/diagnoses that were present at the start of the nursing home stay. Covariates include both items from claims that preceded the start of the stay and information from the first Minimum Data Set 3.0 (MDS) assessment with a target date within 14 days of the beginning of the stay.

Claims-based covariates: Table 6 details the rationale for each of the final selected set of covariates constructed using Medicare claims and enrollment data and used in the risk-adjustment model of the short-stay outpatient ED visit measure.

Table 6. Covariates constructed from claims and used in the risk-adjustment model for Short-Stay Residents who have had an Outpatient Emergency Department Visit

Variable	Rationale
Age	Demographic characteristic that is often important for outcomes of nursing home residents and associated with higher frailty and increasing number of comorbidities.
Sex	Demographic characteristic that is important for predicting ED visits and hospital readmissions for the nursing home population.
Length of stay during the hospitalization preceding the nursing home stay	Patients who are hospitalized for longer periods of time may require more complex care because they are often sicker. In addition, bed rest from prolonged hospitalizations often leads to deconditioning and functional impairment.
Any time spent in the intensive care unit (ICU) during the hospitalization preceding the nursing home stay	ICU stays are an important indicator of medical severity and a predictor of PAC resource use.
Ever enrolled in Medicare under Disability coverage	This is an indicator of overall patient complexity, as qualification for Medicare because of disability requires the presence of serious chronic medical conditions that limit the ability to work.

Variable	Rationale
ESRD	This factor has been identified as a risk factor in prior studies of outcomes among nursing home residents.
Number of acute care hospitalizations in the 365 days before the beginning of the nursing home stay	More hospitalizations in the previous year may be associated with declining health and increased complexity of care
Principal diagnosis as categorized using AHRQ's single-level CCS	First diagnosis from the Medicare claim corresponding to the prior proximal hospitalization as coded by AHRQ's CCS
Outcome-specific Comorbidity Index	Patients with multiple or more severe comorbidities will tend to be frailer, putting them at increased risk for being readmitted to a hospital. This Index is based on the clinical conditions included in the Charlson Comorbidity Index and captures the complexity beyond the linear additivity of the individual comorbidities. See the sub-section below for more details.

MDS-based covariates: For each measure, Abt Associates' internal clinical/MDS expert identified a list of MDS items most likely to increase or decrease the likelihood of the outcome and unrelated to the quality of care received while a resident. These items span multiple domains: functional status, clinical conditions, clinical treatments, and clinical diagnoses. Items included in the risk adjustment model are listed in Table 7.

Table 7. Covariates constructed from the MDS items and used in the final risk-adjustment model for Short-Stay Residents who have had an Outpatient Emergency Department Visit

Category	MDS Item
Functional status	<p>Rarely makes self-understood by others (B0700)</p> <p>Rarely able to understand others (B0800)</p> <p>Cognitive status not completely intact (C0100 – C1000)</p> <p>Cognitive assessment missing (C0100 and C0600)</p> <p>Acute change in mental status (C1600)</p> <p>Rejected care for past four to seven days (E0800)</p> <p>Wandering once or more in the past week (E0900)</p> <p>Walks in room independently or with supervision or limited assistance (G0110C1)</p> <p>Walks in corridor independently or with supervision or limited assistance (G0110D1)</p> <p>Wanders and walks in room or corridor independently or with supervision or limited assistance (E0900, G0110C1 and G0110D1)</p> <p>Alzheimer's or non-Alzheimer's dementia and walks in room or corridor independently or with supervision or limited assistance (I4200, I4800, G0110C1 and G0110D1)</p> <p>Two-person support needed with one or more ADLs (G0110A2 – G0110J2)</p> <p>Dependence in eating (G0110H1)</p> <p>Fell in the last month (J1700A)</p> <p>Fell in the past two to six months (J1700B)</p> <p>Coughing or choking during meals or when swallowing medications (K0100C)</p>
Clinical conditions	<p>Total bowel incontinence (H0400)</p> <p>Daily pain (J0400)</p> <p>Shortness of breath with exertion (J1100A)</p> <p>Shortness of breath when sitting at rest (J1100B)</p> <p>Shortness of breath when lying flat (J1100C)</p> <p>End-stage prognosis (J1400)</p> <p>Dehydrated (J1550C)</p> <p>Internal bleeding (J1550D)</p> <p>Venous/Arterial ulcer present (M1030)</p> <p>Foot infection (M1040A)</p>

Category	MDS Item
	Diabetic foot ulcer (M1040B) Surgical wound (M1040E) Burn(s) (M1040F)
Clinical treatments	Ostomy care (H0100C) Parenteral/IV feeding (K0510A2) Feeding tube (K0510B2) Insulin (N0350A) Anticoagulant received (N0410E) Antibiotic received (N0410F) Chemotherapy for cancer (O0100A1 or O0100A2) Radiation for cancer (O0100B1 or O0100B2) Oxygen therapy (O0100C1 or O0100C2) Suctioning (O0100D2) Tracheostomy care (O0100E1 or O0100E2) Ventilator or respirator (O0100F2) IV medications (O0100H1 or O0100H2) Transfusions (O0100I2) Dialysis (O0100J1 or O0100J2) Isolation or quarantine for active infectious disease (O0100M2) Speech-Language Pathology and Audiology Services (O0400A4) Respiratory Therapy (O0400D2)
Clinical diagnoses	Cancer (I0100) Anemia (I0200) Heart failure (I0600) Orthostatic hypotension (I0800) Ulcerative Colitis/Crohn's disease/inflammatory bowel disease (I1300) Multidrug-resistant organism (I1700) Pneumonia (I2000) Septicemia (I2100) Tuberculosis (I2200) Urinary tract infection (I2300) Viral hepatitis (I2400) Wound infection (I2500) Diabetes mellitus (I2900) Alzheimer's disease (I4200) Non-Alzheimer's dementia (I4800) Seizure disorder or epilepsy (I5400) Asthma, COPD, chronic lung disease (I6200) Respiratory Failure (I6300)
Other	Returned to the nursing home following hospitalization (A1700 and A1800) First assessment was for significant change in status (A0310A)

Comorbidity index: The risk-adjustment model includes an outcome-specific comorbidity index to partially adjust facility-level rates for the case-mix of residents at the facility with respect to comorbidity status at the start of the residents' stay. The comorbidity index is based on the 17 ICD-9-CM based disease condition categories initially developed by Charlson/Deyo.¹² Using the ICD-9-CM coding

¹² Quan H, Sundararajan V, Halfon P, et al. Coding algorithms for defining comorbidities in ICD-9-CM and ICD-10 administrative data. Medical Care 2005;43(11):1130–1139. The 17 conditions categories include: Myocardial infarction, chronic heart failure, peripheral vascular disease, cerebrovascular disease, dementia, chronic obstructive pulmonary disease, rheumatoid arthritis, ulcers, mild liver disease, diabetes mellitus,

algorithm developed by Quan et al.,² we identified the Charlson comorbidities in any of the 21 diagnosis coding fields on all acute hospitalizations claims in the 365 days preceding the patient's nursing home stay. Weights were calculated for each diagnosis indicator through logistic regression of the short-stay outpatient ED visit measure, using all available nursing home stays after a hospital discharge for the time period covered by the measure. The comorbidity index includes only the subset of the 17 ICD-9 based disease conditions for which the logistic regression coefficient was significant at a probability level of 0.05 or better. The appropriate coefficients were used to create a comorbidity index value for each nursing home stay, and these values were used in the logistic regression risk-adjustment model.

Measure Calculations

Observed rate: The actual (observed) rate for a nursing home is calculated as the number of stays where the resident met the numerator criteria divided by the total number of stays that met the denominator criteria in the year.

Expected rate: The risk adjustment model is estimated using logistic regression. The results from the logistic regression are used to calculate the probability of the outcome for each nursing home stay. This probability can be interpreted as the patient's risk of that outcome given their profile. The expected rate for each nursing home is the average probability across all nursing home stays from the hospital at that nursing home in the past year. The coefficients estimated for the most recent are reported in Appendix Table C.

Risk-standardized rate: To obtain the risk-standardized rate for any nursing home, the observed rate is divided by the expected rate which is then multiplied by the nationally observed rate—i.e., the sum of all nursing home stays where the resident met the numerator criteria divided by the sum of all nursing home stays that met the denominator criteria in the year.

$$\frac{\text{Observed Rate}}{\text{Expected Rate}} \times \text{National Rate} = \text{Risk Standardized Rate}$$

diabetes with sequelae, paralysis, chronic renal disease, cancer, moderate to severe liver disease, metastatic cancer, and HIV/AIDS.

PERCENTAGE OF SHORT-STAY RESIDENTS WHO WERE SUCCESSFULLY DISCHARGED TO THE COMMUNITY

Measure Name

The measure name is Percentage of Short-Stay Residents who were Successfully Discharged to the Community.

Purpose of Measure

Many nursing home residents enter skilled nursing facilities for rehabilitation services. For many short-stay patients, return to the community is the most important outcome associated with nursing home care. If a nursing home discharges few residents back to the community successfully, it may indicate that the nursing home is not properly assessing its residents who are admitted to the nursing home from a hospital or not adequately preparing them for transition back to the community.

This claims-based quality measure was first reported by CMS in April 2016, and integrated into the Five-Star Quality Rating System in July 2016. It reports the percentage of short-stay residents who were successfully discharged to the community after a nursing home admission. This section describes the specifications and risk-adjustment methodology for this measure.

Measure Description and Specifications

The short-stay successful community discharge measure determines the percentage of all new admissions to a nursing home from a hospital where the resident was discharged to the community within 100 calendar days of entry and for 30 subsequent days, they did not die, were not admitted to a hospital for an unplanned inpatient stay, and were not readmitted to a nursing home. Note that lower values of the short-stay successful community discharge measure indicate worse performance on the measure.

See Table 7 for detailed specifications for the measure.

Numerator: The numerator for the measure is the number of nursing home episodes¹³ where the resident was discharge to the community within 100 calendar days of entry, and the resident did not die, did not have a claim for an unplanned inpatient admission,¹⁴ and did not enter/reenter a nursing home within 30 days of discharge to the community.

Note that outpatient emergency department visits, outpatient observation stays, and planned inpatient admission are not counted as failed community discharges.

Denominator: The measure includes Medicare fee-for-service enrollees¹⁵ who entered the nursing home from a hospital, were not a resident of the nursing home in the previous 30 days, were not enrolled in

¹³ Note that an episode is defined as a period of time spanning one or more stays in a facility. An episode begins when a resident is admitted to a nursing facility and ends when the person is discharged from the nursing home and did not return for at least 30 days.

¹⁴ See the specifications for the short-stay residents who were re-hospitalized after a nursing home admission measure for the description of planned versus unplanned hospital admissions.

¹⁵ Because the measure uses Medicare claims data, it can only be calculated for Medicare fee-for-service beneficiaries.

hospice during their nursing home stay, and were not identified as comatose based on the MDS admission assessment.

- By definition, a nursing home episode begins when a resident is admitted to a nursing home and ends when a resident is discharged from the nursing home and does not return for at least 30 days.
- Medicare fee-for-service enrollees are identified using the CMS Enrollment Database. Any episode that is for a beneficiary who was enrolled in a Medicare Advantage plan for any part of the episode or who was not enrolled in both Medicare Part A and B for any part of their episode is excluded.
- Episodes that were preceded by an inpatient hospitalization are identified using episode dates linked to Medicare Part A claims. If the hospital discharge date is within one day of the episode start date, then the episode is defined as having been preceded by an inpatient hospitalization and is eligible to be included in the measure.
- We look at the ‘from’ and ‘thru’ dates on hospice claims. If these overlap the nursing home episode, then the episode is excluded.

The denominator for the measure is the number of eligible nursing home episodes, after applying the exclusions described above.

Table 8. Percentage of Short-Stay Residents who were Successfully Discharged to the Community

Measure Description	The percent of short-stay residents admitted to the nursing home from a hospital who were discharged to the community with 100 calendar days of the start of the episode, and who remained in the community for 30 consecutive days following discharge to the community.
Numerator and Denominator Window	The numerator and denominator include episodes that started over a 12-month period. The data have a lag time of 12 months (i.e., the data include episodes that started 12-24 months ago).
Numerator	The numerator includes nursing home episodes for beneficiaries who: <ul style="list-style-type: none"> a) met the inclusion and exclusion criteria for the denominator; AND b) had a discharge assessment within 100 calendar days of the start of the episode; AND c) was not admitted to a nursing home within 30 days of the community discharge, as determined from Medicare claims; AND d) did not have an unplanned inpatient hospital stay within 30 days of the community discharge, as determined from the principal diagnosis and procedure codes on Medicare claims; AND e) did not die within 30 days of the community discharge, as determined from the Medicare Enrollment DataBase.
Denominator	Included in the measure are episodes for residents who: <ul style="list-style-type: none"> a) entered the nursing home within 1 day of discharge from an inpatient hospitalization (Note that inpatient rehabilitation facility and long-term care hospitalizations are not included). These hospitalizations are identified using Medicare Part A claims; AND b) entered the nursing home within the target 12-month period

Denominator Exclusions	<p>Short-stay residents are excluded if:</p> <ul style="list-style-type: none"> a) the resident did not have Fee-for-Service Parts A and B Medicare enrollment for the entire risk period (measured as the month of the index hospitalization and the month after the month of discharge from the nursing home); OR b) the resident was ever enrolled in hospice care during their nursing home episode; OR c) the resident was comatose (B0100 = [01]) or missing data on comatose on the first MDS assessment after the start of the episode; OR d) data were missing for any of the claims or MDS items used to construct the numerator or denominator; OR e) the resident did not have an initial MDS assessment to use in constructing covariates for risk-adjustment.
Covariates	See Tables 8 and 9 for the list of claims-based and MDS-based covariates included in the logistic regression for calculating the facilities' expected rates and the Appendix tables for the risk-adjustment model covariates.

Risk Adjustment

The goal of risk adjustment is to account for differences across nursing homes in patient demographic and clinical characteristics that might be related to the outcome but not to the quality of care provided by the nursing home. Thus, the covariates consist of conditions/diagnoses that were present at the start of the nursing home episode. Covariates include both items from claims that preceded the start of the episodes and information from the first Minimum Data Set 3.0 (MDS) assessment with a target date within 14 days of the beginning of the episode.

Claims-based covariates: Table 9 details the rationale for each of the final selected set of covariates constructed using Medicare claims and enrollment data and used in the risk-adjustment model of the short-stay successful discharge to the community measure.

Table 9. Covariates constructed from claims and used in the risk-adjustment model for Short-Stay Residents who were Successfully Discharged to the Community

Variable	Rationale
Age	Demographic characteristic that is often important for outcomes of nursing home residents and associated with higher frailty and increasing number of comorbidities.
Sex	Demographic characteristic that is important for predicting outcomes for the nursing home population.
Length of stay during the hospitalization preceding the nursing home stay	Patients who are hospitalized for longer periods of time may require more complex care because they are often sicker. In addition, bed rest from prolonged hospitalizations often leads to deconditioning and functional impairment.
Any time spent in the intensive care unit (ICU) during the hospitalization preceding the nursing home stay	ICU stays are an important indicator of medical severity and a predictor of PAC resource use.
Ever enrolled in Medicare under Disability coverage	This is an indicator of overall patient complexity, as qualification for Medicare because of disability requires the presence of serious chronic medical conditions that limit the ability to work.

Variable	Rationale
ESRD	This factor has been identified as a risk factor in prior studies of outcomes among nursing home residents.
Number of acute care hospitalizations in the 365 days before the beginning of the nursing home stay	More hospitalizations in the previous year may be associated with declining health and increased complexity of care
Principal diagnosis as categorized using AHRQ's single-level CCS	First diagnosis from the Medicare claim corresponding to the prior proximal hospitalization as coded by AHRQ's CCS
Outcome-specific Comorbidity Index	Patients with multiple or more severe comorbidities will tend to be frailer, putting them at increased risk for being readmitted to a hospital. This Index is based on the clinical conditions included in the Charlson Comorbidity Index and captures the complexity beyond the linear additivity of the individual comorbidities. See the sub-section below for more details.

MDS-based covariates: For each measure, Abt Associates' internal clinical/MDS expert identified a list of MDS items most likely to increase or decrease the likelihood of the outcome and unrelated to the quality of care received while a resident. These items span multiple domains: functional status, clinical conditions, clinical treatments, and clinical diagnoses. Items included in the risk adjustment model are listed in Table 10.

Table 10. Covariates constructed from the MDS items and used in the final risk-adjustment model for Short-Stay Residents who were Successfully Discharged to the Community

Category	MDS Item
Functional status	<p>Balance turning around (B0300C)</p> <p>Balance moving on and off toilet (B0300D)</p> <p>Makes self-understood by others (B0700)</p> <p>Ability to understand others (B0800)</p> <p>Vision Impairment (B1000)</p> <p>Cognitive impairment based on the BIMS scale (C0500 and C0600)</p> <p>Cognitive assessment missing (C0500 and C0600)</p> <p>Acute change in mental status (C1600)</p> <p>Overall ADL functioning/summary AND cognitive impairment based on the BIMS scale (G0110A,B,D,E,H,J and C0500 and C0600)</p> <p>Overall ADL function/summary missing (G0110A,B,D,E,H,J)</p> <p>Any signs or symptoms of delirium (C1300)</p> <p>Major Depression (CMS quality measure)</p> <p>Major Depression not assessed (CMS quality measure)</p> <p>Any potential indicators of psychosis or behavioral symptoms (E0100 and E0200)</p> <p>Wandering once or more in the past week (E0900)</p> <p>Dependence in bed mobility (G0110A1)</p> <p>Bed mobility missing (G0110A1)</p> <p>Dependence in transfer (G0110B1)</p> <p>Transfer missing (G0110B1)</p> <p>Dependence in walking in room (G0110C1)</p> <p>Walking in room missing (G0110C1)</p> <p>Dependence in walking in corridor (G0110D1)</p> <p>Walking in corridor missing (G0110D1)</p> <p>Dependence in locomotion on unit (G0110E1)</p> <p>Locomotion on unit missing (G0110E1)</p> <p>Dependence in locomotion off unit (G0110F1)</p> <p>Locomotion off unit missing (G0110F1)</p> <p>Dependence in dressing (G0110G1)</p> <p>Dressing missing (G0110G1)</p> <p>Dependence in eating (G0110H1)</p> <p>Eating missing (G0110H1)</p> <p>Dependence in toilet use (G0110I1)</p> <p>Toilet use missing (G0110I1)</p> <p>Dependence in personal hygiene (G0110J1)</p> <p>Personal hygiene missing (G0110J1)</p> <p>Depending in bathing (G0120A)</p> <p>Bathing missing (G0120A)</p> <p>Balance moving from standing to seated position (G0300A)</p> <p>Balance walking (G0300B)</p> <p>Fell in the last month (J1700A)</p> <p>Fell in the past two to six months (J1700B)</p> <p>Medicare RUG IV Hierarchical Group (Z0100A)</p>

Category	MDS Item
Clinical conditions	Any condition related to ID/DD status (A1550) Urinary Incontinence (H0300) Bowel Incontinence (H0400) Shortness of breath with exertion (J01100A) Shortness of breath when sitting at rest (J01100B) Shortness of breath when lying flat (J01100C) Any swallowing disorder (K0100) Weight loss (K0300) Wound infection (I2500) Hemiplegia (I4900) Paraplegia (I5000) Quadriplegia (I5100) Multiple Sclerosis (I5200) Huntington's disease (I5250) Parkinson's disease (I5300) Seizure disorder or epilepsy (I5400) Infection of the foot (M1040A) Diabetic foot ulcer (M1040B) Surgical wound (M1040E) Burn(s) (M1040F)
Clinical treatments	Parenteral/IV feeding, feeding tube, or mechanically altered diet (K0500A–C) Maximum number of injections (N0300 and N0350A) Antipsychotics received (N0400A) Chemotherapy for cancer (O0100A2) Radiation for cancer (O0100B2) Oxygen therapy (O0100C2) Suctioning (O0100D2) Tracheostomy (O0100E2) Ventilator or respirator (O0100F2) IV medications (O0100H2) Transfusions (O0100I2) Dialysis (O0100J2) Isolation or quarantine for active infectious disease (O0100M2) Respiratory therapy (O0400D2) Psychological therapy (O0400E2)
Clinical diagnoses	Cancer (I0100) Anemia (I0200) Heart failure (I0600) Hypertension (I0700) Pneumonia (I2000) Septicemia (I2100) Urinary tract infection (I2300) Viral hepatitis (I2400) Diabetes mellitus (I2900) Hyperkalemia (I3200) Hip fracture (I3900) Other fracture (I4000) Alzheimer's disease (I4200) Cerebrovascular accident, transient ischemic attack, or stroke (I4500) Non-Alzheimer's dementia (I4800) Tourette's syndrome (I5350) Traumatic brain injury (I5500) Malnutrition (I5600) Anxiety disorder (I5700)

Category	MDS Item
	Depression (I5800) Manic depression (I5900) Psychotic disorder (I5950) Schizophrenia (I6000) Asthma, COPD, chronic lung disease (I6200)
Other	Resident needs interpreter (A1100A) Married (A1200) Entered facility from a psychiatric hospital (A1800) Resident expects to remain in the facility or to be discharged to another facility or institution (Q300A)

Comorbidity index: The risk-adjustment model includes an outcome-specific comorbidity index to partially adjust facility-level rates for the case-mix of residents at the facility with respect to comorbidity status at the start of the residents' stay. The comorbidity index is based on the 17 ICD-9-CM based disease condition categories initially developed by Charlson/Deyo.¹⁶ Using the ICD-9-CM coding algorithm developed by Quan et al.,² we identified the Charlson comorbidities in any of the 21 diagnosis coding fields on all acute hospitalizations claims in the 365 days preceding the patient's nursing home episode. Weights were calculated for each diagnosis indicator through logistic regression of the short-stay successful discharge to the community measure, using all available nursing home episodes after a hospital discharge for the time period covered by the measure. The comorbidity index includes only the subset of the 17 ICD-9 based disease conditions for which the logistic regression coefficient was significant at a probability level of 0.05 or better. The appropriate coefficients were used to create a comorbidity index value for each nursing home episode, and these values were used in the logistic regression risk-adjustment model.

Measure Calculations

Observed rate: The actual (observed) rate for a nursing home is calculated as the number of episodes where the resident met the numerator criteria divided by the total number of stays that met the denominator criteria in the year.

Expected rate: The risk adjustment model is estimated using logistic regression. The results from the logistic regression are used to calculate the probability of the outcome for each nursing home episode. This probability can be interpreted as the patient's risk of that outcome given their profile. The expected rate for each nursing home is the average probability across all nursing home episodes from the hospital at that nursing home in the past year. The coefficients estimated for the most recent period are reported in Appendix Table E.

Risk-standardized rate: To obtain the risk-standardized rate for any nursing home, the observed rate is divided by the expected rate which is then multiplied by the nationally observed rate—i.e., the sum of all

¹⁶ Quan H, Sundararajan V, Halfon P, et al. Coding algorithms for defining comorbidities in ICD-9-CM and ICD-10 administrative data. *Medical Care* 2005;43(11):1130–1139. The 17 conditions categories include: Myocardial infarction, chronic heart failure, peripheral vascular disease, cerebrovascular disease, dementia, chronic obstructive pulmonary disease, rheumatoid arthritis, ulcers, mild liver disease, diabetes mellitus, diabetes with sequelae, paralysis, chronic renal disease, cancer, moderate to severe liver disease, metastatic cancer, and HIV/AIDS.

nursing home episodes where the resident met the numerator criteria divided by the sum of all nursing home episodes that met the denominator criteria in the year.

$$\frac{\text{Observed Rate}}{\text{Expected Rate}} \times \text{National Rate} = \text{Risk Standardized Rate}$$